

The alignment to IGb08 of the EPN cumulative solutions

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Introduction

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In this study, we review the process of alignment of the European Frame to IGb08 realized through all the successive EPN cumulative solutions (C1710 to C1934).

- a) Helmert (3T+Sc) comparison of each Cxxxx to IGb08. (xxxx = 1710 : 1934 in steps of 15 except last one, with a step of 14)
- b) Helmert (3T+Sc) comparison of C1934 with the previous realizations.
- c) Statistics of the differences of the CRDS/VELS of C1934 with the previous realizations.
- d) Consequences of type (IGb08) vs. absolute (EPN) antenna calibration

We expect that the 4 Helmert parameters (3 translations and the scale factor): For a) and b) converge to zero.

We expect for c) that the CRDS/VELS of previous realizations tend to coincide to the C1934 realization.

Work with coordinate files, not with SINEX files, as the Cumulative solution SINEX file appears incompatible with the BSW's ADDNEQ2



Analysis of the IGb08 Coordinates

Files available at:

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IGb08: <u>ftp://igs-rf.ign.fr/pub/IGb08/IGb08.ssc</u>

Cxxxx: <u>ftp://epncb.oma.be/epncb/station/coord/EPN/EPN_A_IGb08_Cxxxx.SSC</u> The number of IGb08 – Cxxxx common sites has been constant since C1815 (84 solutions) and in C1934 we have three additional solutions. BRST SN corrected.



IGb08 and Cxxxx Comparision (XYZ)

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Sudden increase in TX, TZ between C1785 and C1800, kept over time as a bias.



IGb08 and Cxxxx Comparision (NEU)

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Conclusion: Cxxxx tracks IGb08 within 1 std. Only the Tu component appears marginal. A small but detectable jump in Tx, Tz is observed in concurrence with the ACC switch BSW50-> BSW52



Convergence of Translations (TXYZ) and Scale factor

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Convergence of Translations (NEU) and Scale factor

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Differences in NEU CRDs (C1934 compared to C1710 and C1920):



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Differences in NEU VELs (C1934 compared to C1710 and C1920):



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C1934: TYPE/Individual calibration sites



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IGb08 and Cxxxx: TYPE/Individual calibration sites

C1710:

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NAME	NEU RESIDUALS IN MILLIMETERS				
ANKR420805M002	1.32	0.20	-1.98		
ANKR520805M002	0.06	0.60	0.71		
ANKR620805M002	0.03	-1.55	-1.65		
BUCU111401M001	0.09	-0.35	1.40		
BUCU211401M001	-1.22	3.95	-1.98		
ISTA220807M001	-0.07	-0.55	-0.22		
METS110503S011	-0.08	0.22	0.09		
NIC0114302M001	-1.41	0.49	2.59		
NIC0214302M001	0.17	1.15	3.21		
NIC0314302M001	2.56	0.28	-0.19		
POTS114106M003	0.04	-0.16	-1.13		
RIGA112302M002	-1.27	0.22	-5.26		
RIGA212302M002	-0.30	0.66	-2.00		
RIGA312302M002	-0.11	-0.25	-0.96		
RIGA412302M002	0.26	0.34	-0.36		
SOFI111101M002	-0.17	0.66	2.66		
SOFI211101M002	1.52	-1.29	8.87		
WTZR114201M010	0.21	-0.64	-1.18		
WTZR214201M010	-0.51	-0.11	-2.94		

C1934:

NAME	NEU RESIDUALS	IN MILLIME	TERS	I
BUCU111401M001	-0.74	0.56	2.22	
BUCU211401M001	-2.33	3.05	-3.56	I
ISTA220807M001	0.61	-0.44	0.59	
METS110503S011	0.04	0.30	0.15	
NIC0114302M001	-1.31	0.83	1.23	I
NIC0214302M001	-0.46	1.30	2.49	
NICO314302M001	2.04	-0.59	-1.03	
POTS114106M003	0.11	-0.12	-1.07	
RIGA112302M002	-1.17	0.27	-5.20	
RIGA212302M002	-0.06	-0.26	-2.06	
RIGA312302M002	0.12	-1.17	-1.02	
RIGA412302M002	-0.29	0.41	-1.06	I
SOFI111101M002	-0.13	0.77	2.72	
SOFI211101M002	0.91	-1.16	8.18	1
WTZR114201M010	0.13	0.39	-1.00	I
WTZR214201M010	0.10	-0.19	-10.00	I

The impact of the type/individual antenna calibrations is below 10 mm in the U component and below 3 mm in the N component reaching to 4 mm for the E component. In all cases, these differences are below our threshold (10 mm in any component: WTZR2 is just at the limit).

Source to get the individual calibration sites: epncb website.



Conclusions and Recommendations

- IGb08 vs C1934: TXZ around 0.4 mm, TY around 0.1 mm and Sc within 0.1 ppb; this means the agreement is excellent.
- IGb08 vs Cxxxx: TN TE Sc within 0.1mm, 0.1 mm, 0.1 ppb; TU shows systematics (TNEU refer to the barycenter of the transformation),
- C1934 vs previous Cxxxx: TXYZ and scale converge to zero; TN TE Sc converge to zero difference, TU has a bell shaped behavior with a peak about C1785, then converges.
- CRD/VEL: evident increase in stability/repeatibility of the most recent solutions relative to the earlier solutions.
- Recommendations

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- Check agreement between IGb and Cxxxx solution numbers (e.g. BRST has a mismatch)
- Make the Cxxxx Sinex usable with e.g. ADDNQ2, so that the analysis can be based on fully populated varcov matrices, rather than on coordinates.
- Generate Cxxxx with full repro2 NEQs, and avoid latitude dependent corrections for conversion IGb05 -> IGb08 in pre wk1631 NEQs

